REMARKS

Reconsideration and allowance of this application are respectfully requested in light of the following remarks.

The Applicants acknowledge with appreciation the indication in the Office Action that claims 74 and 76 are allowed, and that claims 56-57, 68 and 78 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 45 and 51 were rejected under 35 U.S.C. §101 as allegedly "not falling within one of the four statutory categories of invention." (OA, pg. 2). The Office Action specifically alleges that "claims 45 and 51 only recite an abstract idea." (OA, pg. 2).

It is respectfully submitted that the Office Action's rejection of claims 45 and 51 under 35 U.S.C. §101 is incorrect, because both claims 45 and 51 are clearly tied to a particular apparatus and are therefore directed towards statutory subject matter. Specifically, claim 45 recites various features which tie the method of claim 45 to a particular apparatus (i.e., a wireless communication system including a plurality of radio cells), including, for example, "[a] method for balancing the distribution of interference between radio cells in a wireless communication system, the system comprising a plurality of radio cells in which a plurality of subcarrier blocks is used for communication", "...grouping said subcarrier blocks into a plurality of subcarrier block sets in each radio cell of the cell cluster," "...determining a plurality of transmission power levels for each of the radio cells of said cell cluster," and "...assigning the plurality of transmission power levels to the subcarrier block sets of one of the radio cells of the cell cluster by taking into account the assignment of the plurality of transmission power levels to the subcarrier block sets of the other radio cells of the cell cluster." Thus, claim 45 is clearly

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directed towards statutory subject matter. Claim 51 recites similar features which tie claim 51 to a particular apparatus.

Accordingly, it is respectfully submitted that the rejections of claims 45 and 51 under 35 U.S.C. §101 should be withdrawn.

Claims 45, 47-48, 51, 53-55, 69, 71-73, 75, and 81-83 were rejected under 35 U.S.C. §102(b) as being anticipated by Yu et al. (US 6,047,186) (hereinafter, "Yu"). Claims 50, 58-67, 70 and 80 were rejected under 35 U.S.C. §103(a) as being unpatentable over Yu in view of Jang (US 5,579,373) (hereinafter, "Jang"). The Applicants respectfully traverse based on the points set forth below.

Claim 45 is directed towards a method for balancing the distribution of interference between radio cells in a wireless communication system and recites the features of:

> "45. A method for balancing the distribution of interference between radio cells in a wireless communication system, the system comprising a plurality of radio cells in which a plurality of subcarrier blocks is used for communication, wherein a number of adjacent radio cells build a cell cluster, *wherein the radio cells of the cell cluster each comprise corresponding subcarrier block sets, and wherein each subcarrier block has the same subcarriers*, the method comprising:
>
> *grouping said subcarrier blocks into a plurality of subcarrier block sets in each radio cell of the cell cluster*,
>
> determining a plurality of *transmission power levels* for each of the radio cells of said cell cluster, and
>
> assigning the plurality of transmission power levels to the subcarrier block sets of one of the radio cells of the cell cluster *by taking into account the assignment of the plurality of transmission power levels to the subcarrier block sets of the other radio cells of the cell cluster*." (emphasis added)

As explained in the specification, the method of claim 45 reduces the large average signal to interference ratio (SIR) variations due to the mobile stations (MSs) geometries without causing additional SIR estimation, measurement and calculation problems introduced with power

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control. (see, e.g., par. [0031] of the published U.S. application) (it should be noted that references herein to the specification and drawings are for illustrative purposes only and are not intended to limit the scope of the invention to the referenced embodiments).

To better explain the differences between the methods of claims 45, 51, and Yu, the following detailed description of the methods of claims 45, 51, and other pending claims is provided.

The claimed subject matter of the pending claims has a clear focus on the reuse of frequencies in neighboring (i.e. adjacent) radio cells that build a cell cluster, as exemplarily shown in FIG. 5 of the application, where the three hexagonal cells of BS1, BS2 and BS3 form a cell cluster.

The radio cells (e.g. BS1, BS2 and BS3 as shown in Fig. 5) that form a cell cluster use the same subcarriers (frequencies) for communication within each radio cell. This is expressed in the claimed subject matter of claim 45 as follows:

> "...wherein the radio cells of the cell cluster each comprise corresponding subcarrier block sets, and wherein each subcarrier block has the same subcarriers..."

Thus, this claimed feature recites that subcarriers are grouped into subcarrier blocks (see, for example, FIG. 2, where each rectangle on the x-axis indicates a subcarrier block), wherein the subcarrier blocks are further grouped into subcarrier block sets (see FIG. 2: The subcarrier blocks of a subcarrier block set have the same filling pattern; see also paragraph [0104] *et seq.* of the published U.S. application).

Hence, aspects of the method of claim 45 are directed to a communication system having a frequency reuse factor of 1, i.e. adjacent radio cells of the system use the same frequency range (subcarriers) for communication.

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The gist of the method of claim 45 is the coordination of the controlling power levels that are set for the corresponding subcarrier block sets (SBS) in the different radio cells of the cell cluster. The term "corresponding subcarrier block sets" is meant to express that each subcarrier block set of a radio cell of the cell cluster has a corresponding subcarrier block in the adjacent cells of the cell cluster being associated thereto. This may, for example, mean that the resulting subcarrier block sets in each radio cell comprise the same subcarrier blocks in all radio cells of the cell cluster (see paragraph [0104] of the published application). This can also be seen, for example, in FIG. 2, example 1, wherein three subsequent subcarrier blocks on the x-axis are grouped into respective subcarrier block sets for each radio cell, as indicated by the filling patterns. In FIG. 2, example 2, every third subcarrier blocks belongs to the same subcarrier block set. Further, it is understood by those skilled in the art that many other variations of forming subcarrier block sets are also possible.

According to claim 45, power control ranges in the different radio cells of the cell cluster are coordinated:

> "...taking into account the assignment of the plurality of
> transmission power levels to the subcarrier clock sets of the other
> radio cells of the cell cluster"

Examples of how the assignment of the plurality of transmission power levels to the subcarrier block sets of the other radio cells of the cell cluster can be taken into account are shown in the examples of FIG. 2. The patterns of the subcarrier blocks therein also indicates the transmission power levels to which a respecting subcarrier block is mapped. As can be further recognized, each of the three corresponding subcarrier block sets in the three radio cells forming the exemplary cell cluster are mapped to different transmit power levels across the three radio cell, while each transmit power control range is used once in each radio cell. Various pending claims, for example, claims 47, 48, 53 and 54, are directed towards covering the subject matter

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of basic assignment rules, and paragraphs [0107] to [0114] of the published U.S. application also disclose basic, exemplary, non-limiting descriptions of assignment rules according to aspects of the present invention.

One of the benefits of coordinating transmit power levels as described in the specification and as achieved by the method of claim 45 is that the created inter-cell interference for a given subcarrier block is upper bounded by the maximum transmit power allowed for the subcarrier block by the SBS power limit definition. Thus, according to the method of claim 45, the SIR variation may be reduced and a worst case SIR may be estimated in adjacent cells. Since, in the prior art techniques, any transmit power (within overall power limits) is allowed for any subcarrier, the created inter-cell interference varies over a large range. Therefore, according to aspects of the present invention, the SIR variation (from frame-to-frame) may be even further reduced, if a lower power limit is defined for the subcarrier blocks (see, e.g., paragraphs [0095], [0096], [0101], etc. of the published U.S. application and compare the example SIR distribution in FIGs. 3 and 4 of a prior-art system to the SIR distribution achieved when using the method according to aspects of the present invention as shown in FIGs. 6 to 10).

Furthermore, it should be noted that the concept explained above with respect to multiple adjacent cells forming a cell cluster may be also applied to scenarios where the individual cells are divided into plural sectors. Here, adjacent sectors in neighboring cells form a so-called "sector cluster" (see, for example, the circle in the radio cells of BS1, BS2 and BS3 shown in FIGs. 12 and 13, indicating an example of a "sector cluster") and the transmit power levels may be coordinated according to the same rules outlined above for cell clusters, but on the sector cluster level (see also, for example, claims 51, 75, and 76).

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Yu Fails To Anticipate Various Features Of Claims 45 and 51

Yu fails to disclose various features of independent claims 45 and 51, and in fact, fails to disclose any details at all on how different frequency groups are assigned to selected sectors, and further fails to disclose how to utilize different transmission power levels within individual sectors.

As becomes apparent from the passage in col. 1, lines 7 to 15, Yu relates to the assignments of groups of channels to the individual cells within the mobile communication in such a fashion that the system-wide signal-to-noise ratio is maximized over some defined geographical area (see also abstract of Yu et al).

In the section setting out the technical background in cols. 1 to 4, Yu provides a detailed outline of the problem of co-channel interference (channel-to-channel interference) and its connection with larger service areas consisting of multiple radio cells/sectors (see col. 2, lines 5 *et seq.*). Yu et al. focuses on the provision of a frequency reuse concept that provides for a frequency reuse by non-adjacent cells, i.e., by providing buffer cells between two cells utilizing the same set of frequencies (see col. 2, lines 35 to 51). Such a frequency reuse scheme is further described by Yu in connection with the description of FIG. 1 at col. 3, lines 11 through 63.

Yu et al. does not focus on the minimization of the frequency reuse factor, i.e. the avoidance of buffer cells, but rather focuses on a redefinition of the frequency assignment scheme in such systems. As disclosed in col. 4, lines 17 to 48, Yu describes an iterative scheme for assigning the available frequencies (frequency groups or channels) to the individual cells. In comparison to conventional frequency assignment schemes, which are based on an abstract model of the geographical area served by different base stations using a hexagonal cell shape (see FIG. 1, and col. 3, lines 41 to 55), the main focus of Yu is the consideration of the "true"

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physical system and performing frequency assignment on measured data from this "true" physical system. More specifically, the geographic area covered by this system is divided into sectors based on the measured or derived data which are then decomposed into different "sub-problems" in which a frequency assignment can be individually performed (see col. 6, lines 46 to col. 7, line 28).

In summary, this means that the system architecture of Yu et al. is using a frequency reuse factor > 1, in contrast to the methods of claims 45 and 51, which use a frequency reuse factor = 1. Hence, the technique of Yu does not even relate to the use of the same subcarriers (i.e. the same frequencies) in adjacent sectors/cells, in contrast to the claimed subject matter of all of the independent claims, including claims 45 and 51, as discussed above.

In other words, Yu thus fails to disclose at least the features of: "...wherein a number of adjacent radio cells build a cell cluster, wherein the radio cells of the cell cluster each comprise corresponding subcarrier block sets, and wherein each subcarrier block has the same subcarriers," and "...grouping said subcarrier blocks into a plurality of subcarrier block sets in each radio cell of the cell cluster," as recited by claim 45. Furthermore, Yu fails to disclose the features of: "...wherein a sector of a radio cell and its adjacent sectors in neighboring radio cells build a sector cluster, the sector cluster comprising corresponding subcarrier block sets having the same subcarrier blocks, each subcarrier block comprising a plurality of subcarriers," and "...grouping said subcarrier blocks into a plurality of subcarrier block sets in each of the sectors of each radio cell of said sector cluster," as recited by claim 51.

Although the Office Action (pg. 4) alleges that Yu discloses these above-noted features of claims 45 and 51 at "col. 5, lines 1-5," this portion of Yu does not mention anything about using the same subcarriers in adjacent sectors/cells.

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Accordingly, it is respectfully submitted that allowance of claims 45 and 51 and all claims dependent therefrom is warranted for at least this reason.

Furthermore, although Yu provides a detailed and quite complex description of the frequency assignment algorithm used to identify the different sectors within the geographic area covered by the system (see col. 7, line 56 to col. 8, line 13 and the subsequent passages spanning to col. 12, line 58), it is to be noted that nowhere in this description is there any disclosure related to the coordination of transmission power levels within adjacent (i.e. neighboring) radio cells (or sectors) of a cell cluster (or sector cluster), as defined in the subject-matter of the independent claims, nor is there any description of utilizing the same set of frequencies within adjacent radio cells (or sectors) of the cell cluster (or sector cluster).

Therefore, Yu further fails to disclose the feature of "...determining a plurality of transmission power levels for each of the radio cells of said cell cluster," as recited by claim 45. Furthermore, Yu fails to disclose the feature of "...determining a plurality of transmission power levels for each sector of each radio cell of the sector cluster," as recited by claim 51.

The Office Action (pgs. 4-5) alleges that Yu discloses these features at col. 5, lines 8-14. However, this passage of Yu does not mention anything about determining "transmission power levels" at all.

Accordingly, it is respectfully submitted that allowance of claims 45 and 51 is warranted for at least this reason as well.

Moreover, although Yu's technique, like the method of claims 45 and 51, is related to reducing interference (see col. 15, lines 12 to 29), Yu's technique takes a completely different approach of solving the problem of reducing interference as compared to the methods of claims 45 and 51.

Specifically, a basic assumption by Yu is that the individual "sub-problem" (corresponding to a respective part of the geographical area covered by the system) is independent of the other sub-problems (i.e. other geographic area covered by this system) so that the frequency assignment can be performed therein without taking into account any other sub-problems (see col. 7, lines 16 to 28).

A further basic assumption of the improved frequency assignment scheme of Yu is based on assigning different frequency groups to the different sectors within an individual (sub) problem, i.e. a given set of sectors. As disclosed in col. 17, line 14 to col. 18, line 13, there may be an optimization such that individual frequency groups G(i) may be assigned in an overlapping manner (see also FIG. 9 of Yu). However, it is emphasized in this passage that such overlap should be minimized or avoided (see col. 17, lines 55-57, disclosing that the technique of Yu includes assigning individual frequency from group "j" to each of the chosen sector to "minimize" the overlap of the frequencies between those two sectors). This second basic assumption of Yu becomes even more clear based on col. 18, lines 4 to 13 of Yu, suggesting a division of the available frequencies into smaller frequency groups so as to avoid overlap among different sectors (and thus the sub-problems) (see col. 7, line 16 to 28), i.e., independent from the other geographic areas.

First of all, it should be noted that the methods of claims 45 and 51 relate to the assignment of transmission power levels to subcarrier block sets, and not the assignment of different frequency ranges to different geographic areas of cells, as in Yu.

Secondly, Yu explicitly states that the consideration of other sub-problems, i.e. the situation in other geographical areas in the assignment, is to be avoided, while the methods of

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claims 45 and 51 explicitly coordinate the assignment among "geographical area", i.e. radio cells or sectors, respectively.

Hence, for at least the above-noted reasons, Yu fails to disclose the feature of: "...assigning the plurality of transmission power levels to the subcarrier block sets of one of the radio cells of the cell cluster by taking into account the assignment of the plurality of transmission power levels to the subcarrier block sets of the other radio cells of the cell cluster," as recited by claim 45. Similarly, Yu fails to disclose the feature of: "...assigning the plurality of transmission power levels to the plurality of subcarrier block sets of one of the respective sectors of the sector cluster, by taking into account the assignment of the plurality of transmission power levels to the subcarrier block sets of the other sectors of the sector cluster," as recited by claim 51.

It is further noted that the Office Action (pgs. 4-5) alleges that Yu discloses these above-noted features of claims 45 and 51 at "col. 5, lines 15-18 and 21-24." However, this portion of Yu merely describes how frequency groups are assigned to each sector. Thus, as explained above, Yu also fails to disclose these above-noted features of claims 45 and 51.

Thus, it is respectfully submitted that Yu fails to disclose, either expressly or inherently, each of the features of claims 45 and 51, and allowance of claims 45 and 51 is warranted for at least these reasons. Independent claims 69, 73-76 and 81 recite substantially the same features distinguishing method claims 45 and 51 from Yu, though do so with respect to base stations. Accordingly, allowance of claims 45, 51, 69, 73-76 and 81 and all claims dependent therefrom is warranted for at least these reasons.

In view of the above, it is submitted that this application is in condition for allowance, and a notice to that effect is respectfully solicited.

If any issues remain which may best be resolved through a telephone communication, the Examiner is requested to telephone the undersigned at the local Washington, D.C. telephone number listed below.

Respectfully submitted,

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Date: May 16, 2011
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